Material Imagination: on the Avant-Gardes, Time and Computation

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This is a draft of the paper that will appear in *Fun and Software: Exploring Pleasure, Pain and Paradox in Computing*, ed. Olga Goriunova, (Bloomsbury Academic, forthcoming 2014).

The future is our only goal
Varvara Stepanova and Alexander Rodchenko
Slogan from the newspaper *Art of the Commune*

> Those who flick through the pages of old magazines for long enough know that each epoch had its own future, similar to the 'Future in the Past' of English grammar: as if the people of the past extend themselves into infinitude along a straight line, drawn through their own time at a tangent to eternity. Such a future never comes, because humankind walks into the future along a complex and barely comprehensible trajectory …[in these magazines] people from yesterday's tomorrow … stand in their pumped up space suits next to the chubby rockets, and above them an arrow of a space shuttle blasting off glides in the pale zenith – a painfully beautiful Noon of humankind …
> Victor Pelevin, 'Soviet Requiem' in *Pineapple Water for the Beautiful Lady* (Moscow: Eksmo, 2011).

Introduction

This paper explores the kinds of the present time currently available and dominant as they are produced by the computational systems to be socially and culturally lived and vice versa, imagined by art and culture to become and enter the computational streams. Such present times necessitate specific forms of relationality between the past and the future, between computational processes and the avant-gardes, as offering versions of the future. Re-configured enactment of the present in its relation to the past and the future is analysed in this chapter through the close reading of some of the computational devices of digital signal processing. I then attempt to take a discussion of the avant-gardes beyond the discourse of utopia. I am particularly interested in the avant-garde as the provider of the multiplicities of the future, which I explore, among other examples, through software art of the 1990s.

The starting point of the chapter is the sense of the loss of the future, the experience of the perpetual, expandable present. This kind of present results from the changes in the mediation of time and hence its construction that have advanced beyond the 'end of history', and whose effects can be seen and indeed analysed through politics, analysis of financial instruments and trading algorithms, or sociological methodologies.

For instance, Eyal Weizman maintains that there is a shift from the politics of justice to the politics of compassion, emanating 'the culture of immediate and direct action …. culture of emergency [in the now].'[1] 'The specter of the worst [totalitarianism] shapes the politics of the present,' - which then becomes a politics of the perpetual present, politics without a future. 'When utopia seems dangerous, what remains is only the pre-emptive management of … risk'. [2] Here, the 'perpetual economy of immanence'[3] lacks the redemptive mechanism that is 'in excess of all calculations' as thought by the first theorizer of the least possible evil, St Augustine.[4] In Weizman's interpretation of St Augustine, it can be maintained, it is the redemption that is the excess that used to provide a future.

Emma Uprichard explores the perpetual present as a 'sticky time' of sociological imagination, which, through methodological traps of computational methods and the abundance of digitally occurring, non-curated data, gets stuck in the present.[5] She says: 'The increased availability of real-time data sources increasingly means that "to know" becomes not so much

about how to predict the future, but how to predict "now", or better still, to know about now before now has happened. … [W]here the "past" and "future" increasingly become a matter of hours or days, and ultimately more like our present "present", the present itself becomes more and more plastic, to be stretched, manipulated, moulded and ultimately "casted" by those who can access more of it in the supposed "now".'[6] And further: 'it is … possible to envisage a future of constant recursive presents, where we become stuck as we struggle to try to orientate ourselves according to redescriptions of the present as reconditioning the present.' Uprichard argues for becoming unstuck from a 'constant series of "presents"', from the plastic present, going beyond the 'stickiness' of time and temporality for a possibility of the futures to emerge.

The above are just two examples of the current conceptual unease that deals with forms of time. The discussions of the avant-garde, on the other hand, have currently ceased their liveliness, as avant-garde's claims on the future are circumscribed to the utopian and, thus, considered failed and dismissed as illusory constructions belonging to the rational and dominating modernity with its Saint-Simonist will to progress. While Baudrilliard, Virilio, and Bifo, each from different positions have claimed that the present had either speeded up or became illusory to the point of the future vanishing,[7] such constructions call upon the conceptual power of both history, dealing with the past, and the futurologist avant-garde, self-named to initiate the future.

Charity Scribner writes: 'Until recently, utopian thought offered an alternative route away from implacable historical reality. Now, at the purported "end of history" when time seems to pause in the eternal present, utopia veers into the longing for History itself … but also [the desire] to resuscitate the principle of hope that inspired much of the last century's social and cultural production'.[8] Indeed, various futures offered by the avant-gardes may be understood more productively and with a sufficient nuance if premised not on the concept of utopia, and understood as primarily a political claim, ultimately linking the Reason of Enlightment to the calculation of the Cold War, or the dreamworlds produced in the West and in the East alike, as Buck-Morss writes, under the guise of high modernism or industrial modernity and thus eternally undermined with the departure of the 'faith into the modernizing process developed by the West'.[9] The genre of utopia linking Plato's *Republic*, Thomas More's *Utopia* and Chernyshevky's *What Is to Be Done* is much older than modernity itself and, beyond its importance for violent revolutions, is also profoundly connected to what Scribner, following Ernst Bloch's three volume oeuvre on utopia called a 'principle of hope'.

Similarly to how the discrediting of Reason does not halt thinking, connections between certain forms of the avant-garde, and especially early Soviet avant-garde, and specific versions of Marxism, Hegelianism or Russian revolution must not obfuscate the recognition and recovery of the excessive, multimodal and luxurious reserve of potentiality offered by the avant-gardes. Buck-Morss specifically says: '…catastrophic effects need to be criticized in the name of the …utopian hope … not as a rejection of it'.[10]

We could usefully regard the principle of hope as the operation of hope, therefore focusing on the process that makes the avant-gardes and on the constitution of the emergent futures. To distinguish the force of the avant-garde, itself a metaphenomenon not confined to art, from religion and post-secularism, sport or other spheres of activity, which Bloch considers when providing a comprehensive review of utopian thinking, I suggest calling the processes that sustain the avant-gardes and make them susceptible to the production of excessive plurality of the futures an operation of material imagination. The Russian word 'mechta' means both dream and desire and harbours hope. The material imagination is not daydreaming, but material work of desiring production, that can lend itself to various kinds of capturing into amalgamatic actualizations but whose potentiality is not used up by them.

The Computational Time of Off-now

The avant-gardes used to be describable in terms of historical periods and conditions; they used to start and finish, and to recur. The concept of the avant-garde, by the mere morphological

construction of the word used to signify it, prescribes a spatial relationship to time stretched through the body of the onlooker between the behind and in front.

The organization of time into forms of spatialization has been questioned by Bergson, a theme subsequently developed by Deleuze, arguing for a continuum of duration, especially when the actualization of the virtual is concerned.[11] The chronological ordering of events of the duration of human life as intertwined with movement in space allowing for a different organization of a temporality has also been interestingly discussed by Haraway[12] who follows Bakhtin in his concept of chronotope, or timespace.[13] A chronotope, according to Bakhtin, organizes 'real actuality'.[14] Core to the chronotope is movement. Contrary to an understanding of such movement as only that of the (human) body in space is a proposal by Adrian Mackenzie to regard algorithmic space and time through, for instance, the movement of ordering and sequencing, via 'code constructs such as loops' and common data structures such as arrays.[15] Here, 'algorithms organize informatic time' and 'enliven movements lifted out of everyday and existing social orderings'.[16] The abstractions involved in the movement between computational input and output rely on topological transformation and reordering in time as 'concentration or intensification of movements'.[17]

Computational time and space is a social form of time, but there is what Mackenzie calls the 'crafting of computational time', which attunes software in order for it to be synchronized with everyday time. Computational chronotope thus exists within a social framing, but through attempts to 'flow into everyday life'[18], through shifts, disjunctures and disconnections, and also the formation of topological strategies of continuity to align those different times.

Luciana Parisi writes about urban design and topology of continuity in terms of '[anticipation of] the emergence of potential changes'.[19] 'Algorithmic mode of planning defined by an extended apparatus of prediction [is] able not only to establish the condition of the present through the retrieval of the past data, but also... change these conditions according to data variations immediately retrieved from the environment'.[20] The predictive calculation of spatio-temporal emergence that Parisi analyses through focusing on the invariable function in computational planning, is a route to understand specific kinds of computational crafting of space-time, with detailed attention to the evolving structures of the real-time and to the contingent temporalities, among other.

The technicity of time and spatio-temporality, rigorously commented upon by Mackenzie and Parisi,[21] engenders a variety of technical mediations to generate ensembles which structure and construct lived time. The technical mediation of time here generates a regime 'from which time and space unfold'.[22] The computational mediation of time constituted in movements and operations afforded by delays, loops or predictive calculations flows into experienced time to produce new amalgams of time which structure lived reality by taking part in ensembles unfolding to produce it. Such an understanding of the production of lived reality draws upon a variety of scales: making new varieties of time available in a network of relationships between elements as artefacts (samples, pedals, data structures, units, code constructs, software gestures), as processes (sorting and sequencing, ordering and buffering, calculating and predicting, producing, playing back), the clashing of times, and as bodies mediated by computation affects the ensemble produced and the kind of time being dominant.

The computational mediation of time, unveiled through the analysis of code constructs such as arrays or sorting by Mackenzie, can further be usefully exemplified in software gestures dealing with music and noise as sonic realities existing through their unfolding in time. The sonic time and the time of computation here double, triple, and quadruple: as sound is stored, computed, output, layered in with synthesized noise – such times zoom in and out of each other, overlay, and intersect.

The idea of real time in computation is a useful starting point here. Real-time can mean that changes to the process can be introduced in the course of, say, a performance, or it can relate to the time when audio samples leave the computer,[23] a moment that is always behind logical time (that time corresponding to computing operations applied at irregular intervals performed

prior to samples being output for real-time synthesis). The time of real-time composition – live performance - is real time, but the control and audio computations are carried out in turn prior to, and in the pockets in between, real time, according to the order of logical time. 'The reason for using logical time and not real time in computer music computations is to keep the calculations independent of the actual execution time of the computer which can vary for a variety of reasons, even for two seemingly identical calculations'.[24] So there is a real time and another real-time running with delays and in parallel, and a buffer of different size and speed used for different purposes.

A multiplicity of the present time is actually a pre-digital idea:[25] naturally occurring echoes or a reverberation in the bathtub are such simple non-digital examples. Electronic technology, in turn, has been used to record, process and analyse music since the 1940s,[26] where most digital audio 'effects' have their predecessors. In general, as regards the computation of sound, the introduction of the personal computer cannot be seen as the unique starting point. Though there are some techniques possible only in the digital age, analogue synthesizers could do things to sound waves that digital synthesizers and computers carry on doing, and experimental work on early computers, mainly in universities in late 1950s and 1960s, developed methods of audio analysis and synthesis that were promptly implemented in commercial digital synthesizers of the late 1970s – a parallel line to the delayed development of desktop software that would later do the same and more.

Still, audio effects relied on mediation by some form of storage or slight delay. Before the advent of powerful computers, synchronized magnetic tapes were used as the form of storage and slowing one tape, or in the case of a loop, using reel-to-reel tape to make a tape loop were the mechanics behind such effects. This was often done during a performance and worked into the sound, a process that could be further complexified by adjusting the position of multiple recording and playback heads in studio conditions.[27]

With analogue electrical equipment, sound waves were transformed, via a transducer, into their electrical representation, which was then amplified and transformed back into the physical form via a loudspeaker. The work on sound happened between transducer and loudspeaker. Distortion, for example, could be achieved by increasing the electric power supply to an amplifier, altering the shape of audio waves coming through it. Filter effects changed the frequency spectrum of the wave: modulation split the audio signal in two and altered one while leaving the other unaltered in order to then join them together. Here, an electronic representation allowed for a sonic transformation to take place, and, with time-based effects, it relied on a time-delay inaudible to the human ear, on the deep present.

Until 1995, with the storage of audio signals becoming overwhelmingly digital, 'cutting, duplication, speed change and time reversal'[28] remained, but other techniques of synthesizing and altering sound, such as waveshaping, became more powerful – especially true in the case of those relying on the computation of complex mathematical formulae. Equally, techniques of additive synthesis (adding a few sound waves together) were explored, with some research and experimentation into amplitude modulation in the 1960s by Stockhausen, frequency modulation in the 1960s by John Chowning of Stanford University, and waveshaping synthesis in the late 1960s by Jean-Claude Risset, and Yamaha, with their synthesizers, already making use of some of these techniques in 1975.[29] Still, some methods, such as wavetable synthesis and physical modeling, could only advance with digital signal processing technology and powerful computers.

Digital signal processing includes the delay (and buffer) as its fundamental data structure. It is the mediation of digital delay that is my key example of the computational crafting of new realities of time, as layered in with other kinds of time to perform in relation to. Delay is when the signal is shifted by d samples; the time shift equals a delay of d/r time units, where r is the sample rate.[30] A digital delay line is a data structure that allows delay by a number of samples.

The digital delay line is the basis of many things in digital signal processing. Digital delay lines can be implemented as circular buffers (often used in data streaming) and are part of digital delay networks (can be presented as time shifts or frequency domain alterations)[31]. A

delay line itself can change over time as in the case of a variable delay line. Delay line is the foundational structure of any filter since a delay network, "designed specifically for its frequency or phase response is called a filter".[32] Furthermore, some application of filters can be used for Fourier analysis, resynthesis (additive synthesis) and subtractive synthesis. Digital delay lines are used in creating various kinds of audio effects and also in digital waveguide synthesis – a part of physical modeling synthesis first described by Avraamov as further introduced below.

The meaning of delays and buffers range from signifying elements in filter theory (such as in the digital delay line) being part of the process that produces sound, to referring to a form of computation that occurs in blocks (possibly outputting sound) to a rather more colloquial use, referencing the generic reliance of computational processes on timeshifts and redistribution. In this sense, they involve making copies of data, adding them together, going back to calculation, storing the results up, storing the data as well as the computational process whilst it is in constant use in another location, and so on.

However different such uses are, the concepts and operations behind them take hold of time and make it work in rather new ways. With the digital delay line time runs unevenly. The previous slowing down and speeding up of sonic processes translate into the concentration and dilution of the present time. Present time becomes multiple: it slides apart to make space for the time of the calculation; real-time expands; the delayed, the buffered is stored inside a pocket of the present, neither past, nor future, but what can be called *off-now*. The multiple present is seamful. Computational time adjusts through shifts and mismatches to the commonly held everyday present, but even below the 20 or 30 milliseconds inaudible to the human ear sonic computational events transform the experiential construction of time, which lures humans into the macro and micro states of time, into the enduring forms of the present.[33]

To the detriment of the Bergsonian project, software-based functions continue spatializing time, grounding it in geometrical space and movement,[34] but they also draw out of time the capacity to take on new forms – to become pockets of time, to form loops in which the present is suspended, replayed, accumulated.

Goodman interprets Attali's idea of sound as the medium of the future by suggesting a future that is not near or immediately next, but the one that "virtually coexists … [with] the past and opens up to its futurity".[35] Such futurology of anticipation, of hearing in, of prophecy gains power when it is supplemented with the concept of an active, material and excessive production of the future. The avant-gardes do not only hear the hidden societal heartbeat, but also constitute multiplicitous versions of the future. Crucially, such temporality of the avant-gardes seems to enter into direct conflict with computationally mediated time in the ambition to produce novelty that ruptures the present temporality and leaps into the open and emergent future.

Despite Arendt's treatment of artistic work as instrumental, her concept of *natality*, an ability to initiate spontaneous novelty through action, in terms of the political understanding of freedom, can be usefully adapted to understand the futurity of avant-gardes.[36] In fact, it is the early Soviet avant-garde or the more recent avant-garde of digital art found in the blossoming of digital technology as a revolutionary aesthetic that might be seen to have produced the spontaneous freedom that Arendt is drawn to. The idea of fun that this volume pursues has something in common with the radical and spontaneous novelty that Arendt attributed to political action and I would like to think in relation to the (digital) avant-garde. Fun can be seen as related to the avant-garde's impetuous process of the crafting of the multiple futures. The initiation of the new constitutions of the future is a kind of fun that manifests or is disguised differently in every stratum in which it acts.

To the Avant-gardes

The joint examination of computational time, avant-garde and the constitution of the futures can offer a way of understanding the particular becoming of our digital reality. In fact, a claim I want to make here is that the avant-gardes operate within a different dynamic of unfolding wherein the avant-garde's 'Future in the Past'[37] becomes a means of the construction of our present and the

future. Future in the Past is a verb tense of the English grammar that is used to describe what in the past was thought to happen in the future. The future of the avant-garde, 'its only goal', according to Rodchenko and Stepanova, becomes stuck in the past, while forever remaining the future, - it thus has it own form of existence and a relation to our past and present production and the production of our past, present and future. It is through the avant-garde's future-in-the-past that we have a range of futures, also a computational future, even if it currently seems to be happening all the time or not taking place at all.

A recent exhibition on Russian sound technology pioneers of 1910-1930s curated by Andrei Smirnov and Liubov Pchelkina of the Theremin Centre, part of the Moscow Tchaikovsky Conservatory, makes a statement on the avant-garde's future-in-the-past succinctly clear: from the technology of ornamental sound proposed by Arseny Avraamov (1929-1930), as popularized by the sound ornaments of Oskar Fischinger (1932), or Avraamov's conceptualizations and formulae for physical modeling synthesis, as well as descriptions of methods for additive synthesis mentioned above, to the early versions of motion-tracking performed by Bernstein in 1921-1923, the innovations of the aesthetic revolutionaries of the beginning of the XXth century had embarked on developing most of what could only be completed in the 1970s, 1980s or even 1990s.[38] More than that, it is the things that never led to further development and failed to complete that still retain the scintillating unattainability of art in the scale of their audacity in the creation of the novel material versions of the future - such as the 'Symphony of Factory Sirens' by Arseny Avraamov, a performance of fifty locomotive whistles, steamship blasts, hydroplane engines, factory sirens, and two artillery batteries with machine guns and cannon for percussion. Not that technical innovation or technocratic idealization is glorified by such a statement; it is rather a methodology of making new, the fun of mediated cross-species and cross-agents communal creativity transfiguring the present that remains, in some form, in the future that can be found, however perversely modified, in today's creative industry policies, in the wishes of social network communities, self-evolving art projects and in the plans of computationally mediated collective actions.

The avant-garde of early sound experimentation in the Soviet Union, among many other avant-gardes, had an ambition to work according to a different logic, to offer a convergence between 'revolutionary imagination and material form,'[39] to cut through the material, technological, political, social, subjective, to the very core, the engine of the making of the world, in order to reverse-engineer, disassemble and reassemble it, to make a new one, or better, a few. Whether offering an alternative version to capitalist modernity[40], or 'bringing sensory form to utopian ideas'[41], such an excessive imaginary and material impulsion cannot be fully described through a closer engagement with society, power, technology or subjectivity; the engagement is with something more than society and politics, and beyond the technology at hand.

The avant-garde bites into the core of available means through which things become to create ways in which such processes of constitution can in turn become novel. The avant-garde is about assembling physical and metaphysical crossings at which being and becoming can be sustained in new ways. The avant-garde plugs into becoming before it is stratified and tries to bring about, not only a different actualization but a different mode of becoming. It does not only engage with the end-product, it rips open the process of its making in order to multiply, alter, affect the process and produce a materialist ontological revolution. Here, to borrow terminology from Deleuze and Guattari, the aesthetics of the avant-garde participates directly in life. Both a reading of Nietzsche as a theorist of nonhuman-aimed art, of nature itself which has an art-state, and a Guattarian notion of the aesthetic register that transforms and infects itself and other registers until they all function as aesthetic are useful orientations here.[42] Not-just-art, larger than art, non-art, the avant-garde is not a political or social project anymore than it appears as an aesthetic current. It goes beyond; as an inherent revolution in the manner of its actualization, it cannot fail.

To come back to the beginning of this section, the fact that the avant-garde exists as vector directed at the future in relation to its present and seems to have failed to become present when its future passes does not mean that it is utopian. It means that it establishes a unique relation to time and to technology.

Future-in-the-past

Deleuze, through Bergson, argued that the present only exists through and by entering into a relation with its own past. 'The present is not,'[43] and it is through the past that the present is constructed. The past becomes the virtual through which every present, of which there are multiple, actualizes or becomes through differentiation. The present time is a duration, a becoming: it actualizes from the virtual along multiple lines (one or more of which can be stratification).

The 'past co-exists with its own present on various levels'[44] and 'at the same time.'[45] The present never ceases and goes back to itself as a past, which is here an 'ontological memory that is capable of serving as the foundation of the unfolding of time.'[46]

The present of the avant-garde which is the future is the line of actualization of becoming, which stays open. It is not a form of cosmic memory, an inspiration, a shared ideology, a shared past. If such lines and manners are regarded as a future, it is only because there is a becoming involved, but it also implies that they cannot fail, because they are not circumscribed by the now. Time does not check on them whether they became, have failed to become, have become past. Their present is the pure manner of becoming, of differentiation, and such a present always remains a future even if it is in the past.

In the section on the novella in *A Thousand Plateaus* Deleuze and Guattari write, 'They have a future but no becoming.'[47] The future-in-the-past, by contrast, offers myriad becomings, but poses a question of what the future is. Early sound pioneers relate to something that will happen, which does not become a failed utopia, a rigid trauma, but remains multiplicitous becomings. The present never exists because it immediately passes and becomes past; but the future cannot pass, especially when it is the future-in-the-past that never took place. With the avant-garde's time, in the form of something that happened and avoided happening, we have a past that remains a future, that is becoming, dynamic, and multiple. The future-in-the-past is always present, unlike the future, thus, in a certain way it is the only real future. It does not wither, it is a future at hand, a way to become, to be, a line, a modality, a technique, a device, a methodology. Such sets of manners of actualization cannot be described exclusively as creative techniques to be exploited and subsumed. They offer futures, and of a sort that is still to be understood.

Buffered Avant-gardes of the 1990s

It has often been argued, that the conversion of avant-garde into mainstream no longer takes decades, and its recursion is rapid. There are many little avant-gardes, with scarce time to claim failure or success. When the material of culture is processed and advances through calculation, it acquires computational characteristics. A recursion or interslicing of the avant-gardes as they are computed is made prone to algorithms similar to those behind time-based effects: avant-gardes can be delayed to form an echo, played back and looped, sampled, filtered, stored, mixed with a live feed, synthesized or - predictively modelled. Visions realized, enquiries still pertaining to the future, past breakthroughs, a mixture of times is processed to be operated upon, among other, through the architectural-conceptual element of the delay, of the buffer. It is tempting to say that the novelty of the open futures, of manners of actualization is buffered; the future-in-the-past takes the form of the off-now, forming an immediate space, multiple real-time, being stored, delayed, layered, fed back.

Software art and net art, a pair of futures of the past two decades, offered, as avant-gardes do, material imaginaries of human-technical networks to form novel realities. Shaping the functions of culture and art in relation to computational systems and vice versa, they

conceptualized software agencies, tested its manifestations, imagination, habits; described its social and political futures, its breakages. Rather than offering solutions, software art and its precursor – net art, commented on in other chapters of this volume - developed ways of thinking software that revealed its increasingly central position in the processing of culture, society, and subjectivity.

It is through projects such as *Auto-Illustrator*,[48] a vector graphic design application by Adrian Ward of Signwave that jointly won the Transmediale 2001 artistic software award, that software ceased appearing as something contained within certain boundaries and acquired messiness, multiplicities in action, coupling human labour with other agents, including those within and outside the running code. When *Auto-Illustrator* comments 'It's boring. Chose another tool' or offers advice on the fanciness of colour used, it does not only make work somewhat 'fun' but realizes, in material terms, the condition of culture subjected to computational processes, a human confronted with her own technical subjectification, the condition of technicity that has entered a renewed cycle of human genesis. Software art worked through and exploited software materiality, programmable creativity, multi-species distributions of agency, the conditionality of acts driven by the design of computational network. All in all, if software art was not of foundational importance to software, as it existed in its massified form, it certainly became a form of material imagination that brought the art and culture of the 1990s and early 2000s closer to the realization of, and acting upon, as well as creating its own conditions.

A list of artists making Google Art, to be quickly hired by Google, (one would be Douwe Osinga[49]) or of software gestures subsequently implemented in major software applications (the wave-like movement of Mac OS X interface elements following a decade of 'digital folklore' projects breaking up the stability of WIMP interface design[50]) might well be a good inventory to assemble, not the least for the cause of registering prior art - as such things become patented as part of a 'look and feel' design. Ideas and gestures that were appropriated, and that proliferated, could be discussed in detail, starting from those under the general header of 'forerunners' to social networking, blogs, and the aesthetics of connection, such as Eva Wohlgemuth and Kathy Rae Huffman's report on *The Siberian Deal*, essentially a text and image travel diary with a feedback option, HTML-ed and uploaded to the server (through FTP) (1995),[51] or the *Refresh* project (1996), a painstakingly broken dream of decentralization, as if precipitating the development of RSS feed technology,[52] to Heath Bunting's semi-hoax CCTV project (1997) literally realized thirteen years later.[53] To pause for a little here, Bunting's parodic invitation to monitor four webcam streams and report anything suspicious to local police via a provided form is now programmed into a piece of software available from the company Internet Eyes, which aims to use an 'army of volunteers' to watch and interpret CCTV footage online.[54] Anti-utopian parody bypasses the original, mixing times. Here, the technologies of digital signal processing, data compression, cameras, scenarios for interaction, fiber optics, interface design, and others, are all combined in the imagining and construction of a social user, a model of communication, a manner of spending time, a way to be as society. Here, sets of software operations are as important as their active participation in the construction of a user, and of those middle territories formed of people and networks, watching, processing the stream. Here, net art and software art come up with ideas for the culture to be, with ways for it to become: devices and gestures on the rise, marking scheduled human-technical updates.

The readiness and promptness with which the ideas thought up in certain currents of net art and exploratory art practices of the 1990s were embedded into commercial platforms and applications align these art movements with that of Russian constructivism. As in the Russian Constructivism, with its focus on the 'real technical construction' and the invention of the 'productivist artist-engineer,' where drawings were done to also function as technical blueprints, currents in net art and software art invented conceptual and computational gestures, personae, and forms of communal actions in 'productivist' manners, somewhat close to those of a technical plan, developed, played out with and put forth. Indeed, net art explored the computational undergirding coming about through computational means, with works acting as software

functions, even if only thought up, but ready to be reprogrammed and included in large software packages, - similar to constructivism producing its projects in the spirit of integration into everyday societal lives. Constructivism seeking new societal structures through the work of material imagination can be seen as aligned with the computational art of 1990s and 2000s co-constructing and inhabiting the Temporary Autonomous Zones and the zones beyond. Here, not only the visual language of new media descends from the avant-garde, as famously analysed by Lev Manovich[55], but also the aesthetico-political impetus can be seen as shared, as well as a sense of failure and stuffiness of reaction following suit (Stalinist nomenclature on one hand and neoliberal death dance of biopolitical co-option on the other). The unhelpful bitterness in the face of this almost immediate co-option of the avant-gardistic endeavours is another reason to try and think beyond this model, drawing out on the leaking and excessive operation of hope, of material imagination, and its temporal configurations.

Certainly, it is not only the projects that became the (often commerical) present that matter. Things that did not become, that still remain a future, are even more important. As an example, the instruments and imagination of the *Web Stalker* browser by the I/O/D group (1997),[56] conceptualized as a means of enquiry into the material structures of networks, of introducing perspectivalism in relation to the Web, such as in the 'Crawler' and 'Map' function, remain rather unimplemented, a domain of specialist software. The 'Crawler' crawls the target URL, proceeding to follow all the HTML pages that they link to, whereas the 'Map' visualizes the relation of pages within the website and to outside links. It has been used outside of art scenes, for instance, to track all child links and find hidden pages; something being taken further with web crawlers and network analysis and visualization techniques applied to data obtained from social networking platforms. The future software functions here are the gestures of materially imagining a mode of technical being that feeds on engagement with computational infrastructures rendered thick and dense in the acts of using them that become one with modes of understanding them or indeed of producing such modes of being.

A combination of what became reality but ceases to pass and what remains a future, but is presently neatly at hand, in relation to the avant-garde of old technical art forms characterizes the contemporary landscape. The examples given refer to ideas mainly: concepts that call computational formulations into being, problems that necessitate software development. Such a claim can be seen to be one of the many ways in which this volume tries to reformulate the relationship between computation and the history of concepts, programming and social sciences, software development and art. The fun of the avant-garde, stored up in the future-in-the-past or enlisted by predominant data structures, fills in the techno-human formulations of today as they unfold and roll over to institute tomorrow. Not only the importance of avant-garde's fun is to be noticed here, it is the changing shape of novel actualizations of reality that they establish. If a computational mediation of the delay and buffer takes hold of the future-in-the-past looped in the multiple stretchy presents, new sets of problems and actions can be drawn: ones that institute breakages and discontinuity and are able to work through the present in order to draw out multiplicitous futures, destabilizing the delay, folding the loop.

There are still formulations, events, expressions that become past. A delayed future-in-the-past is joined by the once present and then passed, such as the celebrated democracy of HTML, a channel for everyone to raise their voice, make a statement, a means of enunciation currently rendered useless if unsupported by the complications of contemporary web design and scripting or conversely by its equally complicated enablement in (mainly corporately owned) blogs and CMSs. In a similar vein, Zittrain warns of the dangers of the 'appliancization' of the Internet, a condition in which the once indubitable open architecture of the Web and desktop computing is jeopardized and may effectively be closed into a ramified system of single-service appliances, granting little control and no place for maneuver in relation to what they are, can become, or do to the user and the network.[57]

Past simple and past perfect, present, future-in-the-past and future enter into a new interlocking machine, an agreement expressed most acutely in the form of computational

systems and the one that must be recognized if the becoming is not to be lost to just very few options in the face of technological temporal complexity. The software-based processing of time creates layers inside layers, well-managed or glitchy delays, parallel, intersecting and closed-circuited time structures. It is not only the enduring ephemeral described by Chun, but a buffered present that cannot become either past or produce a future. Present and threatened, withered away, gone, left in limbo, multiplicitous futures form clusters whose temporal dimensions are confusing.

Multiplicitous futures and the incomputable machine

Can there be the versions of the future that are not utopian? Can there become a present that fulfills the avant-gardes' multiplicitous futures? Is computational time always the continuous present? Perhaps, in fact, the answer to all these questions should be negative. The vector of the future is not a temporal movement due to arrive at a state of completion. The avant-gardes are not reducible to causing an action, whether immediate or delayed. And the computability is never complete, but contains the uncomputable.

Luciana Parisi comments on the computational construction of the future and Massumi's work in the following way: '…a preemptive mode of power foreclosing futurity into actualities is not the same as the uncomputable machine of the event'.[58] She argues that topological invariants in computation that pre-empty change through continuous variation and '[re-program] the event before it can happen' is not the only existent computational reality, but, thinking together with Whitehead, she suggests that the transduction of qualities into quantities is 'infected with abstract non-denumerable relations of pure quantities, eternal objects: discrete yet permanent relations adding novel character to existing... relations… Each parametric extensive relation is hosting another order of quantities that cannot be contained by the number of its actual members'.[59] These are 'abstract quantitative order of relations'[60] always escaping overall continuity; the dark spaces of 'parasitic quanitites', discontinuity, contingency, the uncomputable always included into the computational processing of matter. For Parisi, there is always, grounded in the logic and computational elements, the problematic and contingent that exceeds the control and exhausts pre-emption. The computed continuous present includes the uncomputable, the rupturing black holes of other times.

The other times that can burst through the buffered elastic present include those with the potentiality of the avant-gardes. The avant-gardes offer distinctive and intensive kinds of production of the multiplicitous becomings, the imaginary crafting of the futures. Such processes, such futures in the form of becomings, the multiple unfoldings into and of the future are not one, are in excess. As an excess, such reserve of material imagination also escapes buffering as much as it is subjected to it. The avant-garde's multiplicities of the future, inclusive of multiple histories, still exist in the ruptures of today as enactive force that cannot be fully lost to the perpetual present.

The material working out of multiplicitous futures by the avant-gardes is not a dream that 'comes against reality and fails to insert itself,'[61] but an operation of imagination. The force of such material imagination is not non-rigorous or intrinsically linked to domination, and the call upon its intensity is not nostalgic. It is indeed the avant-gardes' multiplicitous futures that are the reserve and excess to be called upon when the construction of the multiple present is required, whether such present (and the future) is to be posthuman, ecologically sustainable, transdisciplinary and ethical.[62]

In *Author and Hero in Aesthetic Reality* Bakhtin wrote that the future cancels out the present and the past, rather than following from them.[63] What expression such an actualization will take, we shall see.

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[1] Eyal Weizman, *The Least of All Possible Evils*. *Humanitarian Violence from Arendt to Gaza*, Verso: N-Y – London, 2011, p.37.

[2] Loc. cit.

[3] Ibid. p.21.
[4] Ibid. p.38.
[5] Emma Uprichard, 'Being Stuck in (Live) Time: the Sticky Sociological Imagiation' in *The Sociological Review*, 60:S1, pp. 124–138 (2012), DOI: 10.1111/j.1467-954X.2012.02120.x
[6] Ibid. p.133
[7] Paul Virilio, "The Visual Crash" in *Ctrl[Space]: Rhethorics of Surveillance from Benthan to Big Brother*, Cambridge, MA: MIT Press, 2002; Jean Baudrillard, *The Vital Illusion*, N-Y: Columbia University Press, 2000; Franco Berardi (BIFO), *After the Future*, Oakland: AK Press, 2011.
[8] Charity Scribner, *Requiem for Communism*, Massachusetts: MIT Press, 2005, p.9-10.
[9] Susan Buck-Morss, Dreamworld and Catastrophe. The Passing of Mass Utopia in East and West, Massachusetts: MIT Press, 2002, p.X.
[10] Ibid. p. XIV.
[11] Gilles Deleuze, *Bergsonism*, N-Y: Zone books, 1991; Henri Bergson, *Matter and Memory*, N-Y: Zone books, 1991.
[12] Donna J. Haraway, *Modest_Witness@Second_Millenium.FemaleMan©_Meets_OncoMouse™. Feminism and Technosience*. N-Y – London: Routledge, 1997, p.41.
[13] Mikhail Bakhtin, *The Forms of Time and Chronotope in the Novel*, Complete Oeuvres, Vol. 3, Theory of the Novel (1930-1961), Moscow, 2012. [in Russian, *Formy vremeni i khronotopa v romane*]
[14] Bakhtin, pp.341-342.
[15] Adrian Mackenzie, *Cutting Code. Software and Sociality*, N-Y: Peter Lang, 2006, p.51-57.
[16] Mackenzie, *Cutting Code,* pp.56, 57.
[17] Ibid., p.57.
[18] Ibid., p.64.
[19] Luciana Parisi, 'Digital Design and Topological Control' in *Topologies of Culture* (special issue), eds. Celia Lury, Luciana Parisi and Tiziana Terranova, *Theory, Culture & Society*, Volume 29, N 4 and 5, 2012, p. 167.
[20] Ibid. p.167.
[21] Adrian Mackenzie, *Transductions. Bodies and Machines at Speed*, London – N-Y: Continuum, 2002, p.89. and Luciana Parisi, op.cit.
[22] Mackenzie, p.95.
[23] Puckette, Miller. *The Theory and Technique of Electronic Music.* London: World Scientific, 2010, p.61
[24] Loc. cit.
[25] Steve Goodman, "The Sonic Algorithm" in Matthew Fuller, ed., *Software Studies: A Lexicon*, Cambridge, MA: MIT Press, 2005, p.230.
[26] Puckette, p.XIII.
[27] Andrei Gorokhov, *Muzprosvet* [In Russian], <http://www.muzprosvet.ru>, accessed 01.07.2013.
[28] Puckette, p.27
[29] Eduardo Reck Miranda, *Computer Sound Design. Synthesis Techniques and Programming.* Oxford: Focal Press, 2002.
[30] Puckette, p.181.
[31] A delay network can be worked with in two ways – in the time domain ('we draw waveforms as functions of time, and consider delays as time shifts') and the frequency domain ('we dose the input with a complex sinusoid (the output is a sinusoid of the same frequency) and report the altitude and/or phase change as a function of frequency', Puckette, p.185. The time and frequency domains are two ways of understanding delay networks, depending, again, on time: when delays are short and humans cannot hear them, frequency domain picture is used.

[32] Puckette, p.225.
[33] Wendy Chun's concept of an 'enduring ephemeral' can be seen as related here. Wendy Hui Kyong Chun, 'The Enduring Ephemeral, Or The Future is a Memory' in *Place Studies in Art, Media, Science and Technology. Historical Investigations on the Sites and the Migration of Knowledge*, eds. Andreas Broeckmann, Gunalan Nadarajan, Weimar: Verlag und Datenbank für Geisteswissenschaften, VDG, 2009. See also the concept of microsound developed by Curtis Roads.
[34] Steve Goodman, "Timeline (Sonic)" in Matthew Fuller, ed., *Software Studies*.
[35] Steve Goodman, *Sonic Warfare. Sound, Affect, and The Ecology of Fear,* Massachusetts: MIT Press, 2010, p.49.
[36] Hannah Arendt, *The Human Condition*, Chicago: The University of Chicago Press, 1998, pp.8, 9, 247.
[37] E.g.: I thought I would get that job though I had a feeling that the interview was going to be a disaster. Both 'would get' and 'was going to be' here are in Future in the Past tense.
[38] Theremin Centre, <http://theremin.ru>, accessed 09.05.2012. Andrey Smirnov, *Sound in Z. Experiments in Sound and Electronic Music in Early 20th Century Russia*, London: Koenig Books, 2013.
[39] Buck-Morss, p. 64. Buck-Morss offers her own theory of time/temporality of the avant-garde.
[40] Christina Kiaer, *Imagine No Possessions. The Socialist Objects of Russian Constructivism*, Massachusetts: MIT Press, 2005, p.1.
[41] Buck-Morss, pp. 65-66.
[42] Friedrich Nietzsche, *The Birth of Tragedy and Other Writings,* trans. Ronald Speirs, Cambridge: Cambridge University Press, 1999; Félix Guattari, *Chaosmosis*, *an ethico-aesthetic paradigm*, Sydney: Power Publications, 1995.
[43] Deleuze, *Bergsonism*, p.55.
[44] Ibid., p. 74.
[45] Ibid., p. 61.
[46] Ibid., p. 59.
[47] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus, Capitalism and Schizophrenia vol.2*, N-Y: Continuum, 2004, p.216.
[48] Signwave *Auto-Illustrator* 1.2, <http://swai.signwave.co.uk>, accessed 9.05.2012.
[49] Some of Douwe Osinga work can be accessed through Runme software art repository by searching on his name at: <http://runme.org>, accessed 9.05.2012.
[50] See Olga Goriunova, *Art Platforms and Cultural Production on the Internet*, N-Y - London: Routledge, 2012.
[51] Eva Wohlgemuth and Kathy Rae Huffman, *The Siberian Deal,* 1995, <http://www.t0.or.at/~siberian> (not available).
[52] *Refresh* online project, 1996, no longer available online.
[53] Irational, *CCTV*, 1997, <http://www.irational.org/heath/cctv/>, accessed 9.05.2012.
[54] *BBC News*: 'Cash prizes for catching CCTV criminals', 4 Dec 2009, <http://news.bbc.co.uk/1/hi/technology/8393602.stm>, accessed 9.05.2012.
[55] Lev Manovich, *The Language of New Media*, Mass: MIT Press, 2002.
[56] I/O/D *Web Stalker*, 1996, <http://bak.spc.org/iod/>, accessed 9.05.2012.
[57] Jonathan Zittrain, *The Future of the Internet and How to Stop It*, N-Y: Penguin Books, 2008.
[59] Parisi, p. 185.
[60] Ibid., p.186.
[61] Michel Foucault, *The Birth of Biopolitics, Lectures at the College de France 1978-1979*, N-Y – London: Palgrave, 2010, p.320.
[62] Rosi Braidotti, *The Posthuman*, N-Y – London: Polity, 2013.

[63] Mikhail Bakhtin, "Author in Hero in Aesthetic Activity", in Russian in *Ehstetika Slovesnogo Tvorchestva*, Moskva: Iskusstvo, 1979, p.107.